WATER RESOURCES REVIEW for JANUARY 1972

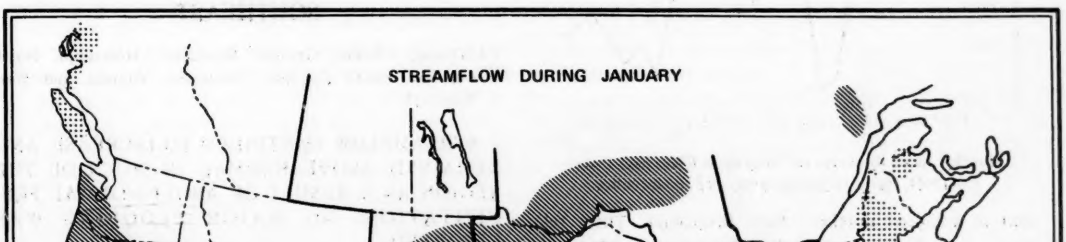
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS BRANCH

STREAMFLOW AND GROUND-WATER CONDITIONS

High carryover flows from December contributed to above-normal streamflow during January in several major areas, including North Dakota, Minnesota, Ontario, and Mississippi. Heavy rains were also a major factor causing high flows in Mississippi; flows increased there but decreased in the other three States. Intense rains and melting snows caused severe flooding in western Washington and Oregon. Peak discharges of some streams equalled those likely to occur on the average of only once in 50 years.

Flows in the below-normal range for the month were limited principally to Maine and northern New Brunswick in the Northeast and to western British Columbia in the West, somewhat similar to the situation that prevailed during December.

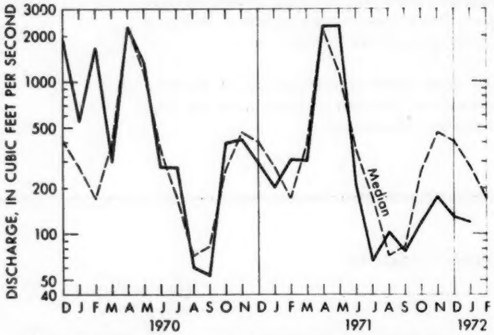


NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

FLOWS INCREASED IN MOST STREAMS IN THE MARITIME PROVINCES BUT DECREASED IN NEARLY ALL OTHER PARTS OF THE NORTHEASTERN REGION. STREAMFLOW WAS GENERALLY IN THE NORMAL RANGE. HOWEVER, FLOWS WERE BELOW NORMAL IN MUCH OF MAINE.

Streamflow decreased and remained in the below-normal range in much of Maine (see graph of Piscataquis River near Dover-Foxcroft in east-central part of State)



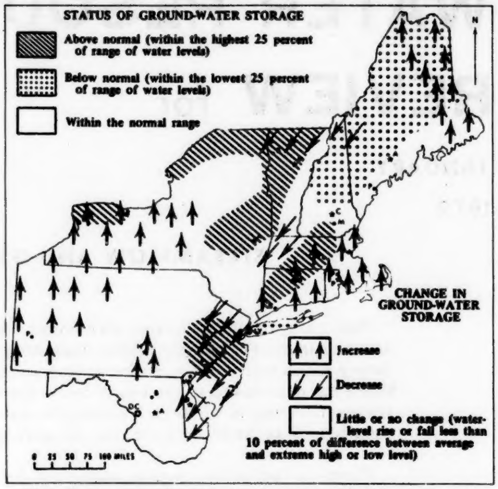
Monthly mean discharge of Piscataquis River near Dover-Foxcroft, Maine (Drainage area, 297 square miles.)

and in adjacent northern New Brunswick. These relatively low flows contrasted with highest monthly discharge of record for January in eastern Quebec—10,000 cfs on the Outardes River at Outardes Falls (drainage area, 7,230 square miles; period of record, September 1922 to January 1972).

Flows of major rivers in the region decreased but remained in the normal range (see table on page 9).

In Maine, water content of snow near monthend ranged from more than 6 inches in the west and north to negligible amounts along the coast. In New Hampshire and Vermont, limited data indicated that water content of snow was generally above average. Elsewhere in New England, there was little or no snow cover.

Ground-water levels rose in Connecticut, Rhode Island, eastern Massachusetts, and western parts of New York and Pennsylvania; and declined in most of New Jersey (see map). Monthend levels were below normal on Long Island, N.Y., and in much of Maine and New Hampshire; and were near or above normal in the remainder of the region.



Map shows ground-water storage near end of January and change in ground-water storage from end of December to end of January.

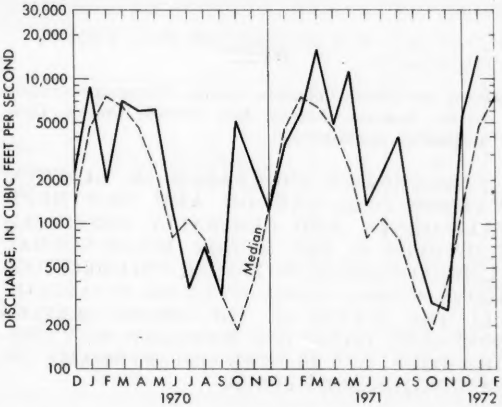
SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW CONTINUED TO INCREASE AND REMAINED ABOVE NORMAL IN MUCH OF THE REGION AS A RESULT OF ABOVE-NORMAL PRECIPITATION. NO MAJOR FLOODING WAS REPORTED.

High carryover flows from December along with heavy rains in January caused above-normal runoff in many parts of the Southeast, including Mississippi. For example, in west-central Mississippi, monthly mean discharge of Big Black River at Bovina rose from 5,600 cfs to 14,000 cfs (see graph); highest daily flow during January was nearly 35,000 cfs on the 14th, and lowest was estimated to be 1,200 cfs on the 31st.

In Florida, streamflow was within the normal range in most of the State but was considerably below median in some central areas. Flow of Silver Springs decreased by 20 cfs, to 740 cfs, 91 percent of normal for the month. In the southeast, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, decreased by 15 cfs, to 29 cfs, 70 percent of normal. Flow of Miami Canal at Miami increased by 125 cfs, to 245 cfs, 76 percent of normal. (Note: In the December 1971 issue of the Review, on page 4, flow of Miami Canal was



Monthly mean discharge of Big Black River near Bovina, Miss. (Drainage area, 2,810 square miles.)

described as being 36 percent of normal; the figure should have been given as 63 percent of normal.)

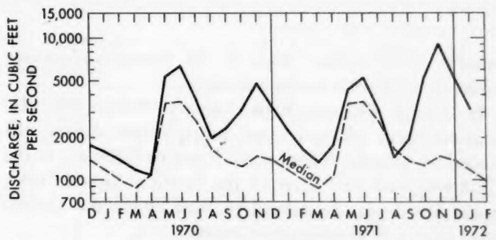
Ground-water levels generally rose. Monthend levels were above average in Kentucky, central and western North Carolina, and in West Virginia (except in the extreme northeastern corner). In Georgia,levels generally rose in the heavily pumped Savannah and Brunswick areas, attributable in the latter place, at least in part, to the holiday shutdown at a large pulp industry. In Mississippi, levels rose in both the Graham Ferry and Pascagoula Formations along the Gulf Coast as well as in the Sparta Sand in the Jackson area; however, levels in both areas were substantially below those of a year ago. In Florida, levels rose slightly in the northeastern and north-central parts of the State, and declined in the southeastern part and in the northwestern and central peninsular parts of the State; monthend levels were below average in most of the State.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW INCREASED IN OHIO AND SOUTHERN MICHIGAN AND INDIANA BUT DECREASED ELSEWHERE IN THE REGION. FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN ONTARIO NORTH OF LAKE SUPERIOR, AND IN MOST OF MINNESOTA.

Streamflow was in the normal range in most of the region. However, from the Cochrane-James Bay area of Ontario, west and south into Minnesota and northwestern Wisconsin, high carryover flows from December were the principal cause of above-normal flows for January. In far western Ontario, monthly mean discharge of English River at Umfreville was 3,150 cfs (see graph) highest for January in the 51 years of record and



Monthly mean discharge of English River at Umfreville, Ontario (Drainage area, 2,470 square miles.)

the 3d consecutive month with record-high streamflow for the given month. In east-central Minnesota, monthly and daily mean discharges of Crow River at Rockford (drainage area, 2,520 square miles) were highest for January in the 47 years of record—–429 cfs and 680 cfs (on the 1st), respectively. The monthly flow was more than 9 times the median discharge for the month, and the 16th consecutive month with monthly discharge in the above-normal range.

Ground-water levels declined in Minnesota, Wisconsin, and most of Michigan; remained about the same in Ohio; and rose in southern Michigan. Monthend levels were near or above average in Michigan, Minnesota, and Wisconsin; and remained below average in Ohio. Levels continued to decline in the heavily pumped, deep artesian aquifers in the Milwaukee, Wis., area; and continued to rise in artesian aquifers in the Minneapolis-St. Paul, Minn., area, but remained below average.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW INCREASED SLIGHTLY IN EASTERN TEXAS, NORTHWESTERN LOUISIANA, AND WESTERN KANSAS, AND DECLINED ELSEWHERE IN THE REGION. ABOVE-NORMAL FLOWS CONTINUED OVER MOST OF NORTH DAKOTA AND IN CENTRAL AND SOUTHERN TEXAS.

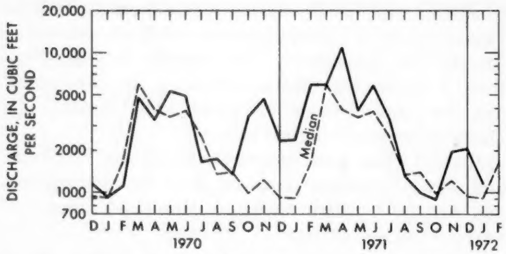
Flow of Guadalupe River near Spring Branch, in south-central Texas, continued above the normal range for the 6th consecutive month; and flow of North Bosque River near Clifton, in north-central Texas, was in the above-normal range during 3 of the past 4 months. In contrast, flow of North Concho River near Carlsbad, in the west-central part of the State, remained below the normal range for the 3d consecutive month. Flow of Comal Springs at New Braunfels, between Austin and San Antonio in south-central Texas, remained steady at about 322 cfs.

In Louisiana, above-average precipitation in December resulted in high carryover flows while normal rainfall amounts in January held many streams at or near

bankfull stage during most of the month and caused moderate highwater in the northeast.

In North Dakota, high January streamflow also resulted from above-average precipitation during the preceding months. Cannonball River near Breien, in the southwest, and Red River of the North at Grand Forks, in the northeast, continued to flow above the normal range for the 4th consecutive month.

In eastern Iowa, flow of Cedar River at Cedar Rapids, declined sharply during January, from the above-normal range and 218 percent of median in December to the normal range and 125 percent of median during January (see graph).



Monthly mean discharge of Cedar River at Cedar Rapids, Iowa (Drainage area, 6,510 square miles.)

In Manitoba, the level of Lake Winnipeg at Gimli, averaged 714.79 feet above mean sea level, a rise of 0.36 foot, and was 1.87 feet above the long-term mean for January.

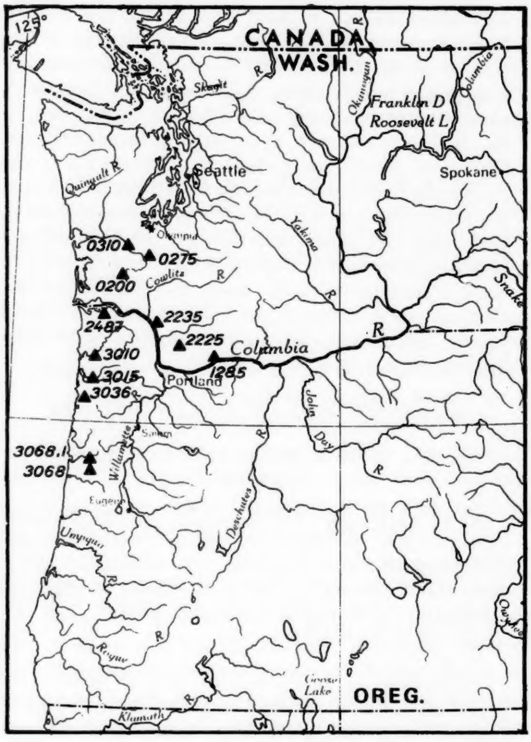
Ground-water levels declined in Iowa, but changed only slightly in Kansas, Nebraska, and North Dakota. Monthend levels were near average in North Dakota and were above average in Iowa. In the rice-irrigation area of east-central Arkansas, levels rose in both the shallow and the deep aquifers; monthend levels in the shallow aquifer (Quaternary deposits) were in the same range of January values prevailing since 1963, but in the observation well tapping the deep aquifer (Sparta Sand) the level was a new low for the month. In the industrial aquifer of central and southern Arkansas (Sparta Sand), levels declined at Pine Bluff (central) and rose slightly at El Dorado (southern). In Louisiana, levels in most aquifers continued to rise, although the key well for the terrace deposits in the central area did not yet respond to the heavy rains of the previous month. In Texas, levels rose in the Edwards Limestone at Austin and in the bolson deposits at El Paso; and declined in the Edwards Limestone at San Antonio and in the Evangeline aquifer at Houston. Monthend levels were above average at Austin and San Antonio, and below average at El Paso and Houston.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW INCREASED IN ALBERTA, WASHINGTON, OREGON AND NORTHERN CALIFORNIA AND GENERALLY DECREASED ELSEWHERE IN THE REGION. BELOW-NORMAL FLOWS CONTINUED IN BRITISH COLUMBIA AND ABOVE-NORMAL FLOWS OCCURRED IN PARTS OF ALL THE STATES OF THE REGION (EXCEPT MONTANA), INCLUDING MAXIMUM PEAK DISCHARGES OF RECORD ON STREAMS IN WASHINGTON AND OREGON.

Major flooding occurred along the western slope of the Oregon Coast Range, from the Columbia River to the Alsea River and Siuslaw River basins January 11 and 21, and on many streams in southwestern Washington



Location of stream-gaging stations in Oregon and Washington described in the table of peak stages and discharges.

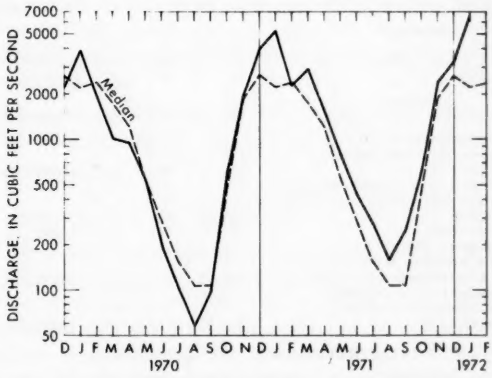
Provisional data; subject to revision

STAGES AND DISCHARGES FOR THE FLOODS OF JANUARY 1972 AT SELECTED SITES IN WASHINGTON AND OREGON

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
WASHINGTON											
CHEHALIS RIVER BASIN											
12–0200	Chehalis River near Doty.	113	1939–72	Feb. 7, 1945	17.80	18,100	Jan. 20	18.36	20,000	177	50
12–0275	Chehalis River near Grand Mound.	895	1928–72	Dec. 29, 1937	18.39	48,400	21	18.32	50,300	56.2	50
12–0310	Chehalis River at Porter.	1,294	1952–72	Jan. 27, 1971	23.41	47,900	22	23.85	51,400	39.7	60
WIND RIVER BASIN											
14–1285	Wind River near Carson.	225	1934–72	Dec. 23, 1964	19.26	28,300	20	19.29	31,000	138	60
LEWIS RIVER BASIN											
14–2225	East Fork Lewis River near Heisson.	125	1929–72	Dec. 22,1933	12.3	15,600	20	12.92	18,000	144	60
KALAMA RIVER BASIN											
14–2235	Kalama River below Italian Creek, near Kalama.	198	1946–72	Nov. 20, 1962	15.28	16,600	20	15.8	18,000	90.9	50
OREGON											
BEAR CREEK BASIN											
14–2487	Bear Creek near Svensen.	3.33	1965–72	Jan. 5, 1966	3.10	162	Jan. 11	3.46	380	114	.....
NEHALEM RIVER BASIN											
14–3010	Nehalem River near Foss.	667	1939–72	Jan. 25, 1964	21.10	43,200	21	......	49,000	73.5	50
WILSON RIVER BASIN											
14–3015	Wilson River near Tillamook.	161	1915, 1916 1931–72	Feb. 1916 Dec. 22, 1964	[a]20.8 [b]20.26	 32,100	21	......	33,000	205	50
NESTUCCA RIVER BASIN											
14–3036	Nestucca River near Beaver.	180	1964–72	Jan. 28, 1965	19.53	24,000	11	21.98	30,000	167	.....
ALSEA RIVER BASIN											
14–3068	Flynn Creek near Salado.	.78	1958–72	Jan. 28, 1965	4.72	137	11	4.73	139	178	30
14–3068.1	Dear Creek near Salado.	1.17	1958–72	Jan. 28, 1965	4.21	201	11	4.22	203	174	30

[a]From floodmarks, site and datum then in use.
[b]Site and datum then in use.

January 20–22, as a result of intense rainfall, reportedly more than 7 inches in 6 hours at Nehalem, Oregon, plus melting snow at low elevations. Warm winds and rain on heavy snowpack also produced near record peak discharges on higher elevation streams in eastern Washington during the January 20–22 period. In the western part of the State, peak discharges on some streams were greater than those likely to occur on the average once in 50 years. Locations and discharges of selected stream stations are shown on the accompanying map and table. The effect of the flood runoff on the daily and monthly discharges of Wilson River near Tillamook, Oregon, is shown in the accompanying graphs. At least six persons drowned during the two flood periods and total damages were estimated to be in excess of $6.1 million. In northwestern California, associated hydrologic events caused a daily flow of 48,700 cfs on the 22d on the Salmon River at Somes Bar



Monthly mean discharge of Wilson River near Tillamook, Oreg. (Drainage area, 161 square miles.)

(drainage area, 751 square miles)—more than 22 times the median flow for the month.

Provisional data; subject to revision

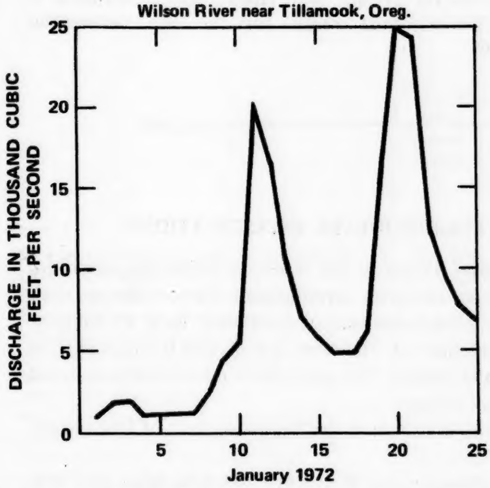
USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JANUARY 1972

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Dec. 1971	End of Jan. 1972	End of Jan. 1971	Average for end of Jan.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	38	46	39	54	223,400 (a)
QUEBEC					
Gouin (P)	50	42	90	62	6,487,000 ac-ft
Allard (P)	60	49	56	42	280,600 ac-ft
MAINE					
Seven reservoir systems (MP)	32	28	42	47	179,300 mcf
NEW HAMPSHIRE					
Lake Winnipesaukee (PR)	56	55	55	55	7,200 mcf
Lake Francis (FPR)	49	35	31	50	4,326 mcf
First Connecticut Lake (P)	35	24	40	36	3,330 mcf
VERMONT					
Somerset (P)	71	72	52	58	2,500 mcf
Harriman (P)	56	46	27	47	5,060 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	82	79	66	69	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	57	53	41	43	34,270 mcf
Indian Lake (FMP)	55	63	77	53	4,500 mcf
New York City reservoir system (MW)	82	87	66	....	547,500 mg
NEW JERSEY					
Wanaque (M)	97	93	84	74	27,730 mg
PENNSYLVANIA					
Wallenpaupack (P)	76	76	57	49	6,875 mcf
Pymatuning (FMR)	82	78	71	83	8,191 mcf
MARYLAND					
Baltimore municipal system (M)	100	100	89	82	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	80	84	77	77	12,580 mcf
High Rock Lake (P)	67	77	50	67	10,230 mcf
Narrows (Badin Lake) (P)	101	102	100	79	5,616 mcf
SOUTH CAROLINA					
Lake Murray (P)	78	85	79	60	70,300 mcf
Lakes Marion and Moultrie (P)	84	93	87	64	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	58	68	51	53	75,360 mcf
GEORGIA					
Burton (PR)	75	83	71	53	104,000 ac-ft
Lake Sidney Lanier (FMPR)	57	64	41	50	1,686,000 ac-ft
Sinclair (MPR)	79	90	88	76	214,000 ac-ft
ALABAMA					
Lake Martin (P)	71	97	77	65	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	33	47	39	25	1,166,000 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	42	49	31	28	1,452,000 cfsd
Douglas Lake (FPR)	12	15	17	12	715,800 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	49	56	47	38	523,700 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	45	55	47	33	751,400 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	78	55	58	40	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	72	48	45	31	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	29	26	20	20	1,640,000 ac-ft

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Dec. 1971	End of Jan. 1972	End of Jan. 1971	Average for end of Jan.	Normal maximum
	Percent of normal maximum				
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	90	86	85	....	22,640,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	89	88	86	70	1,948,000 ac-ft
OKLAHOMA					
Keystone (FPR)	141	86	88	86	661,000 ac-ft
Lake O' The Cherokees (FPR)	97	86	87	76	1,492,000 ac-ft
Tenkiller Ferry (FPR)	105	99	98	85	628,200 ac-ft
Lake Altus (FIMR)	20	21	22	51	134,500 ac-ft
Eufaula (FPR)	94	91	87	78	2,378,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	102	95	86	86	2,722,000 ac-ft
TEXAS					
Possum Kingdom (IMPRW)	96	94	61	76	724,500 ac-ft
Buchanan (IMPW)	97	96	85	76	955,200 ac-ft
Bridgeport (IMW)	62	62	84	58	270,900 ac-ft
Eagle Mountain (IMW)	98	97	91	84	182,700 ac-ft
Medina Lake (I)	100	99	63	46	254,000 ac-ft
Lake Travis (FIMPRW)	92	93	94	75	1,144,000 ac-ft
Lake Kemp (IMW)	28	28	37	53	461,800 ac-ft
THE WEST					
ALBERTA					
Spray (P)	58	45	14	43	210,000 ac-ft
Lake Minnewanka (P)	64	54	36	52	199,700 ac-ft
St. Mary (I)	72	72	55	62	320,800 ac-ft
WASHINGTON					
Franklin D. Roosevelt Lake (IP)	95	94	95	76	5,232,000 ac-ft
Lake Chelan (PR)	44	28	32	45	676,100 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (IMP)	76	77	77	67	4,282,000 ac-ft
WYOMING					
Pathfinder, Seminoe, Alcova, Kortes, and Glendo Reservoirs (I)	70	71	59	33	3,016,000 ac-ft
Buffalo Bill (IP)	71	66	50	65	421,300 ac-ft
Boysen (FIP)	87	80	72	67	802,000 ac-ft
Keyhole (F)	78	78	59	29	199,900 ac-ft
COLORADO					
John Martin (FIR)	3	5	6	19	364,400 ac-ft
Colorado–Big Thompson project (I)	75	75	79	51	722,600 ac-ft
Taylor Park (IR)	61	63	98	55	106,000 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	55	54	46	....	31,276,500 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	79	78	77	53	1,421,000 ac-ft
CALIFORNIA					
Hetch Hetchy (MP)	38	29	41	30	360,400 ac-ft
Lake Almanor (P)	68	62	72	43	1,036,000 ac-ft
Shasta Lake (FIPR)	73	77	76	70	4,377,000 ac-ft
Millerton Lake (FI)	47	61	81	62	503,200 ac-ft
Pine Flat (FI)	41	44	65	50	1,014,000 ac-ft
Isabella (FIR)	22	22	32	23	551,800 ac-ft
Folsom (FIP)	61	59	52	51	1,000,000 ac-ft
Lake Berryessa (FIMW)	85	86	101	82	1,600,000 ac-ft
Clair Engle Lake (Lewiston) (P)	79	82	90	79	2,438,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	74	70	73	50	744,600 ac-ft
NEVADA					
Rye Patch (I)	92	97	93	42	179,100 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	69	70	66	64	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	13	14	1	16	948,600 ac-ft
Salt and Verde River system (IMPR)	50	51	53	37	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	44	44	68	....	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	7	9	15	....	2,539,000 ac-ft

[a] Thousands of kilowatt-hours.

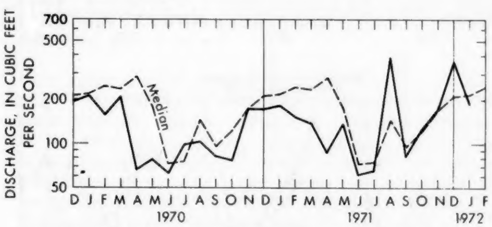


Daily discharges of Wilson River near Tillamook, Oreg., January 1972, showing high discharges that occurred on January 11, 20, and 21.

In Idaho, continuing releases from upstream reservoirs, plus runoff from the valleys, increased flow of Snake River at Weiser (drainage area, 69,200 square miles) to the highest monthly discharge for January in 62 years of record.

In southern Montana, flow of Yellowstone River at Corwin Springs decreased and was in the normal range for the first month since June 1971.

Above-normal flow continued on Humboldt River at Palisade in northeastern Nevada, for the 20th consecutive month; and on Weber River near Oakley in northeastern Utah, and North Platte River above Seminoe Reservoir near Sinclair in south-central Wyoming, for the 8th consecutive month. Flow of Virgin River at Littlefield in northwestern Arizona, declined sharply from that of December and was only 86 percent of median for the month (see graph).



Monthly mean discharge of Virgin River at Littlefield, Ariz. (Drainage area, 5,090 square miles.)

Contents of the Colorado River Storage Project decreased 350,500 acre-feet during the month. Contents of irrigation reservoirs in southern Idaho were at near record high levels. Withdrawals for power production held reservoirs in northern Idaho at below-average levels. In Utah, elevation of Great Salt Lake rose 0.45 foot during January and at monthend was 0.20 foot above the maximum elevation of last year, which occurred July 1.

Ground-water levels generally rose in Washington, Nevada, central Utah, and southern New Mexico; remained about the same in southeastern Utah; and declined in Montana. Monthend levels were above average in Washington, Nevada, northeastern Utah, and in the Boise Valley of southern Idaho; near average in Montana and southern California; and below average in central Utah, southern New Mexico, and in the Snake Plain aquifer in the Rupert-Minidoka area of southern Idaho. In southern Arizona, the level in the key well at Avra Valley was lowest of record at that site. In southern New Mexico, rises in levels during recent months reflected decreased or discontinued pumping for irrigation during the winter season along with recharge from above-normal precipitation.

ALASKA

Streamflow ranged from below normal in the southeast (Juneau area) to above normal in the interior (Fairbanks–Palmer area), and was in the normal range on Kenai Peninsula south of Anchorage. Flow of Sheep Creek near Juneau was in the below-normal range for the 2d consecutive month and was only 50 percent of the January median. In central Alaska, flow of Chena River at Fairbanks continued in the above-normal range for the 4th consecutive month and flow of Little Susitna River near Palmer moved into the above-normal range for the first month since August 1971. Below-normal January temperatures caused sharp declines in flow of all interior streams.

Ground-water levels declined in the Anchorage area but were significantly higher than the levels of a year ago.

HAWAII

Reversing the trend of increasing streamflow that persisted through the three preceding months, January flows declined at all index stations in the State except Kalihi Stream near Honolulu, Oahu, where a sharp increase in flow late in the month moved the January mean into the above-normal range. Extremely low flows occurred at this station earlier in the month and the daily discharge of 0.65 cfs on the 13th, 14th, 20th, and 21st, was the lowest for January since records began in 1913.

Drought conditions nearing disaster proportions on the pasture lands of the western slopes of Haleakala on Maui, were relieved by steady rains on January 24. Flow of Honopou Stream near Huelo, Maui, continued in the below-normal range for the 9th consecutive month.

NEW PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

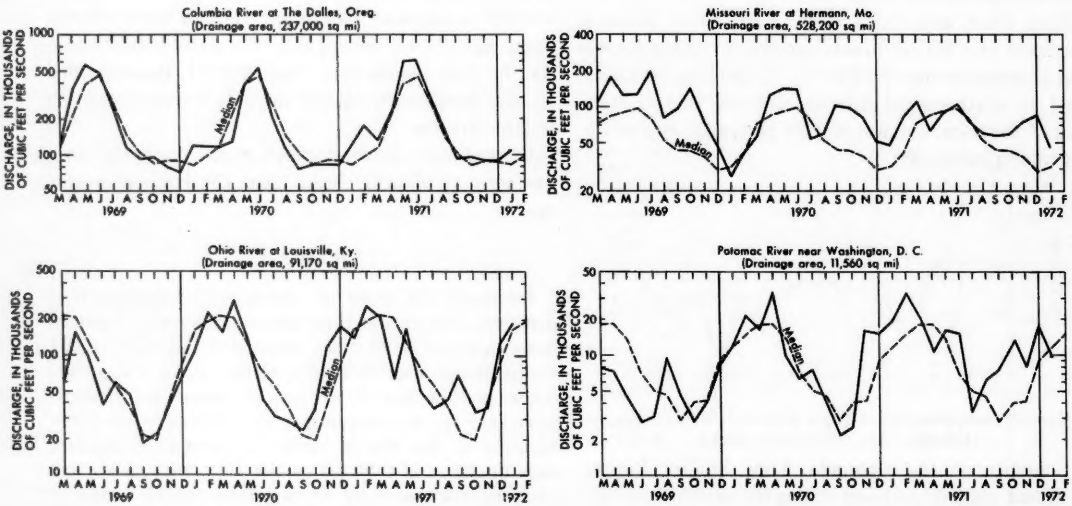
Two new manuals have been published by the U.S. Geological Survey in the series on techniques describing procedures for planning and executing specialized work in water-resources investigations. One of the manuals describes procedures and forms used to compile and evaluate particle-size and concentration data, to compute fluvial-sediment discharge, and to prepare sediment records for publication. The other new manual is intended to be a guide for hydrologists using borehole geophysics in ground-water studies. The emphasis is on the application and interpretation of geophysical well logs, and not on the operation of a logger.

The two manuals, listed below, may be purchased at the prices shown from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Application of borehole geophysics to water-resources investigations, by W.S. Keys and L.M. MacCary: U.S. Geological Survey Techniques of Water-Resources Investigations Book 2, Chapter E1. 1971. 126 pages. $1.75.

Computation of fluvial-sediment discharge, by George Porterfield: U.S. Geological Survey Techniques of Water-Resources Investigations Book 3, Chapter C3. 1972. 66 pages. $0.75.

HYDROGRAPHS OF FOUR MAJOR RIVERS



FLOW OF MAJOR RIVERS DURING JANUARY 1972

River and location	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	January 1972					
			Monthly mean discharge (cfs)	Percent of median monthly discharge[1]	Change in discharge from previous month (percent)	Discharge near end of month		
						(cfs)	(mgd)	Date
St. Lawrence River at Lake St. Lawrence[2]	295,200	239,100	221,300	103	- 6	238,000	154,000	28
Delaware River at Trenton, N.J	6,780	11,360	13,216	102	- 30	12,600	8,140	26
Susquehanna River at Harrisburg, Pa	24,100	33,670	42,320	114	- 23	46,000	29,700	31
Potomac River near Washington, D.C	11,560	10,650	9,750	85	- 44	6,600	4,270	31
Altamaha River at Doctortown, Ga	13,600	13,380	36,600	265	+ 66	61,800	39,900	28
Tombigbee River near Coatopa, Ala[3]	15,400	22,160	77,150	253	+108	14,500	9,370	31
Missouri River at Hermann, Mo	528,200	77,480	47,750	151	- 43	31,100	20,100	27
Ohio River at Louisville, Ky[4]	91,170	110,600	194,300	119	+ 54	196,000	127,000	27
Mississippi River near Vicksburg, Miss[5]	1,144,500	552,700	697,900	145	+ 22	630,000	407,000	31
Colorado River near Grand Canyon, Ariz	137,800	....	13,260	....	- 12	....	....	....
Columbia River at The Dalles, Oreg[6]	237,000	194,000	106,400	128	+ 20	....	....	....
Fraser River at Hope, British Columbia	78,300	95,300	27,100	104	- 19	....	....	....

[1]Reference period 1931–60 or 1941–70.
[2]Records furnished by Department of the Army, Corps of Engineers, Buffalo District. Discharges shown are considered to be the same as those at Ogdensburg, N. Y., which is directly opposite Prescott, Ontario.
[3]At Demopolis lock and dam.
[4]Records furnished by U.S. Army, Corps of Engineers.
[5]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[6]Discharge (adjusted for upstream storage) determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

WATER RESOURCES REVIEW — JANUARY 1972

Cover map shows generalized pattern of streamflow for January based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for January 1972 is compared with flow for January in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below normal* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for January is considered to be *above normal* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range*. In the Water Resources Review *normal flow* is defined as the median of the 30 flows of January during the reference period. The normal (median) has been obtained by ranking those 30 flows in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the normal (median).

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the January flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of January. Water level in each key observation well is compared with average level for the end of January determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels* unless described otherwise, are from the end of December to the end of January.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. In the United States, issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Washington, D.C. 20242.

This issue was prepared by J.C. Kammerer, H.D. Brice, E.W. Coffay, and L.C. Fleshmon from reports of the field offices, February 5, 1972.

WATER RESOURCES OF THE UPPER WHITE RIVER BASIN, EAST-CENTRAL INDIANA

The accompanying abstract, table, and maps are from the report, *Water resources of the upper White River basin, east-central Indiana*, by L.W. Cable, J.F. Daniel, R.J. Wolf, and C.H. Tate, U.S. Geological Survey Water-Supply Paper 1999-C, 38 pages, 1971; prepared in cooperation with the Indiana Department of Natural Resources, Division of Water. Water-Supply Paper 1999-C may be purchased for $1.00 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

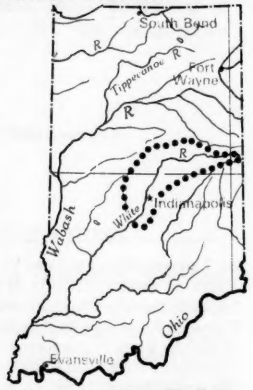


Figure 1.—Map of Indiana showing location of report area.

ABSTRACT

Ground-water discharge to the streams sustains year-round streamflow in the upper White River basin (fig. 1). This discharge, referred to as ground-water runoff or base runoff (table 1), is considered to be an index to the amount of ground water available for development. A comparison of the variations of ground-water runoff and aquifer distribution in the basin shows that the areas of best development potential are areas where thick sand and gravel aquifers are adjacent to the streams. The average ground-water runoff for these areas is between 400,000 and 500,000 gallons per day per square mile.

The most permeable aquifers in the basin are the sand and gravel deposits of Quaternary age. These aquifers occur mainly as relatively thick elongate bodies along bedrock valleys and as relatively thin sheet-like deposits at or near land surface. The representative hydraulic conductivity of these aquifers ranges from 1,500 to 2,500 gallons per day per square foot. The limestone and dolomite formations of the bedrock are a source of moderate quantities of water.

The long-term average streamflow in the basin is approximately 0.9 cubic foot per second per square mile. The yearly average discharge varies from about one-fourth to twice the long-term average. The 7-day 10-year low flow ranges from about 0.01 to 0.3 cubic foot per second per square mile; the main-stem flow ranges from 0.10 to 0.13 cubic foot per second per square mile.

The water in the aquifers is predominately a very hard calcium bicarbonate type; it is generally high in iron and contains a moderate amount of dissolved solids. Fresh water (1,000 milligrams per liter dissolved solids or less) is present to depths of approximately 400 feet below land surface. In the tributaries and in the headwaters region of the White River, the composition of surface water is very similar to that of ground water. The quality of the water in the White River deteriorates in the downstream direction owing to the cumulative effects of sewage effluent.

Table 1.—*Average yearly discharge and average yearly base runoff at selected stations in the White River basin*

[Average discharge is discharge for comparable base-runoff record]

Station No. (fig. 2)	Station name	Average discharge		Average base runoff	
		Cubic feet per second	Inches per year	Cubic feet per second	Inches per year
3–3470	White River at Muncie	222	12.50	72.4	4.08
3475	Buck Creek near Muncie	34.3	13.11	20.4	7.80
3485	White River near Noblesville	796	13.04	341	5.59
3495	Cicero Creek near Arcadia	118	12.22	46.9	4.86
3497	Little Cicero Creek near Arcadia	39.4	13.22	12.4	4.16
3501	Hinkle Creek near Cicero	19.7	14.44	7.12	5.22
3510	White River near Nora	1,053	11.73	507	5.64
3515	Fall Creek near Fortville	166	13.32	91.5	7.35
3525	Fall Creek at Millersville	235	10.70	127	5.78
3535	Eagle Creek at Indianapolis	152	11.86	62.5	4.88
3538	White Lick Creek at Mooresville	198	12.68	85.0	5.44
3540	White River near Centerton	2,325	12.90	1,362	7.56

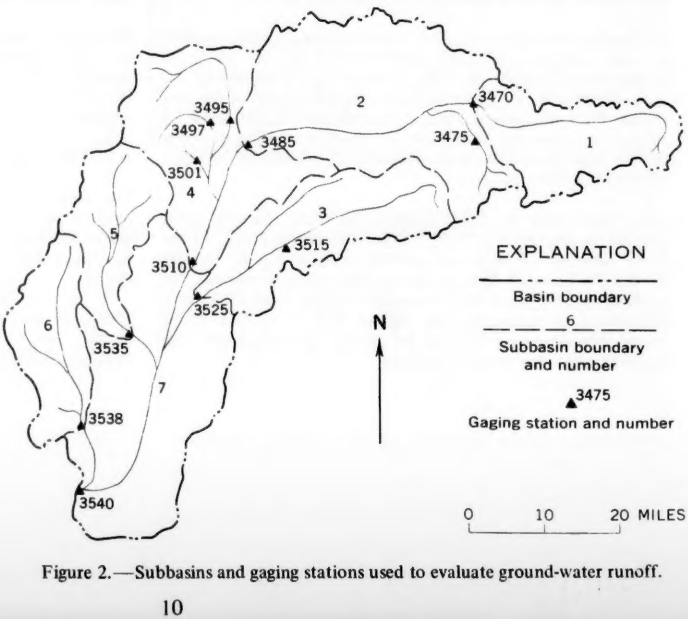


Figure 2.—Subbasins and gaging stations used to evaluate ground-water runoff.